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Pedipalps and Venom Vesicle Anomalies in Two Families of Scorpions (Scorpiones: Hemiscorpidae, Buthidae) from Iran

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Abstract: The developmental anomalies are reported in this study. The first and second abnormally are presented in right pedipalps of *Paraorthochirus* and *Orthochirus* (Buthidae) while *Paraorthochirus* pedipalp just includes coxa, trochanter and without other parts (femur, patella, movable and fixed finger). The right pedipalp of *Orthochirus* specimen has abnormally too; it has all parts of pedipalp except complete fixed finger. In both of scorpions, the left pedipalp is normal. Another case is present in venom vesicle of *Hemiscourpius* (Hemiscorpidae). Pictures and morphometric measurements for three specimens are given.

Key words: Pedipalp, venom vesicle, Buthidae, hemiscorpidae, developmental anomalies

INTRODUCTION

There are some reports on anomalies from families Buthidae, Euscorpidae, Bothriuridae, Chactidae, Hemiscorpidae, Iuridae, Scorpionidae, Chaerilidae, Liocheliidae (Mattoni, 2005).

Body duplication has been most abnormality in the family Buthidae and Brauer (1917) documented duplication of prosoma in embryo of *Euscorpium carpathicum*. Vachon (1972) have been illustrated an adult *Isomertus maculatus* with partial duplication of the venom vesicle. Duplication metasomas and telson have been reported in *Centruroides vittatus* by Sissom (1995). Another cases for this abnormality have been observed in *Centruroides sculpturatus* Ewing by Williams (1971) and *Hottentotta* (*Buthotus*) *alticola* (Pocock) by Vachon and Serfaty (1950). The first duplication of anterior body parts in butids was observed in *Tityous cambridgei* Pocock from Belem state of Para, Brazil, this abnormally was included in two carapaces each with a complete set of eyes and four pedipalps (Matthiesen, 1979). Karatas and Colak (2005) demonstrated an abnormal structure on telson of *Leirus quiquestriatus* (Ehrenberg).

For other anomalies related to pedipalp, Graham (2006) described malformed pedipalp finger dentition in *Superstitionia donensis*. Duplication of pedipalp segments in the scorpion *Androctonus crassicauda* was identified by Karatas and Kurtullu (2006).

Leg malformations of four buthid species were recorded by Armas (1977), as well as tergal and sexual anomalies in Bothriurid scorpions by Mattoni (2005).

Teruel (2004) was demonstrated pedipalp chela compression of females in some scorpions families like scorpionidae, Buthidae, Iuridae, Euscorpidae, Chactidae. There are the first records for developmental anomalies of venom vesicle on *Hemiscourpius* and losing some parts of pedipalps on *Paraorthochirus* and *Orthochirus* scorpions.

MATERIALS AND METHODS

The specimens were collected (night catch method using by UV light) from Khoozestan province South-West of Iran. We found three scorpions with abnormally in venom vesicle and pedipalp while examining scorpion samples.

The scorpions were preserved in 70% ethanol and deposited in the scorpion collection at the Reference Lab of Scorpion in Razi Vaccine and Serum Research Institute of Khoozestan, Iran.

RESULTS AND DISCUSSION

Khoozestan province is in south-west of Iran. There are around of 12 genera and 20 species of scorpions in this province that this diversity is relate to different weather and plants, we maybe find more new genera and species in this province.

Pedipalp malformations: Two specimens with anomaly in pedipalp were identified as *Paraorthochirus* and *Orthochirus* genera (Fig. 1, 2). The adult female



Fig. 1: Anomaly in right pedipalp of *Paraorthochirus* specimen



Fig. 2: Right pedipalp abnormally in *Orthochirus* specimen

Paraorthochirus and female *Orthochirus* specimens were collected from Shadegan (Southern part of Khoozestan province). Morphometric measurements for *Paraorthochirus* are: total length 23.33 mm, carapace length/width 2.85/3.09 mm, mesosoma length 8.20 mm, metasoma (segment I) length/width 2.11/2.27 mm, metasoma (segment V) length/width 2.6/2.58 mm and telson length 2.26 mm and for *Orthochirus* follow measurements were determined: total length 25.94 mm, carapace length/width 3.56/3.06 mm, mesosoma length 8.79 mm, metasoma (segment I) length/width 2.94/2.87 mm, metasoma (segment V) length/width 3.28/2.80 mm and telson length 2.75 mm. Other morphometric measurements related to femur, patella and chela pedipalps for two genera are shown in Table 1 and 2.

The right pedipalp of *Paraorthochirus* just has coxa and trochanter that it was ended to an appendage and the rest of segments are lost, while the left pedipalp (including coxa, trochanter, femur, patella and chela) is normal and has important characters like trichobotria, that is the one essential character to identify scorpion genera related to

Table 1: Measurements (mm) of left and right pedipalps of malformed *Paraorthochirus* specimen

Pedipalp measurement	Left pedipalp	Right pedipalp
Pedipalp (L)	8.90	-
Femur (L/W)	1.99/0.63	-
Patella (L/W)	2.65/0.67	-
Chela (L)	4.26	-
Fixed finger	2.10	-
Movable finger (L)	2.70	-

L: Length, W: Width

Table 2: Measurements (mm) of left and right pedipalps of malformed *Orthochirus* specimen

Pedipalp measurement	Left pedipalp	Right pedipalp
Pedipalp (L)	10.09	10.09
Femur (L/W)	2.68/0.98	2.68/0.98
Patella (L/W)	2.93/1.00	2.93/1.00
Chela (L)	4.48	2.78
Fixed finger	2.21	1.17
Movable finger (L)	3.00	3.00

L: Length, W: Width



Fig. 3: Venom vesicle with abnormal structure in *Hemiscorpis* specimen

Orthochirus. *Paraorthochirus* is kind of genus that was known from *Orthochirus* by d_2 trichobotria on dorsal surface of femur (Kovarik, 2004). *Orthochirus* has abnormally in right pedipalp, all segments of pedipalp like coxa, trochanter, femur, patella and manus, movable finger are present but fixed finger is short. Total of trichobotria on pedipalps are important to diagnosis in level of family and in addition to pedipalps are critical segments for starting mating behavior then these abnormally maybe affect on reproductive of scorpion.

Venom vesicle malformation: The adult male of *Hemiscorpis* genus collected from Baghmalek (Eastern part of Khoozestan) has abnormally in vesicle but don't have any morphological different with other samples of *Hemiscorpis*. Total length of the scorpion (Fig. 3) is 25/3 mm. The complete morphometric measurement of the specimen is shown in Table 3.

Table 3: Measurements (mm) of *Hemiscorpius* specimen

Characters	Measurement (mm)
Carapase (L/W)	5.79/5.11
Pedipalp (L)	22.12
Femur (L/W)	5.56/2.08
Patella (L/W)	5.54/2.19
Chela (L)	10.06
Movable, finger (L)	5.70
Fined finger (L)	3.75
Mesosoma (L)	16.19
Metasoma	
Segment I (L/W)	6.41/1.7
Segment (V/L/W)	7.66/1.29
Telson (L)	-
Vesicle (L/W)	4.06/2.34
Total length	25.00/3.00

L: Length, W: Width

The venom vesicle has unusual structure. The shape is deformed with a lot of projection on surface it which could have been a result of regeneration of the scorpion aculeus or of an abnormal embryonic development that this deformity was described for *Leiurus quinquestriatus* by Karatas and Colak (2005). The cause of these malformations in venom vesicle and pedipalps are unknown for the *Hemiscorpius*, *Paraorthochirus* and *Orthochirus* scorpions. In venom vesicle abnormally do not seem to affect the life of the scorpion but in novel deformity of pedipalps affected mating and generation of this specimens.

CONCLUSIONS

This study shows that abnormality exist in scorpions like other animals. These tratogenic changes do not depend on special genus and species but anomalies affect some biological behaviors and maybe they are important to identify of some specimens.

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